Delirium in the elderly patient after anesthesia: associated factors

Delirio en el adulto mayor sometido a anestesia: Factores asociados

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Abstract

Introduction: Postoperative delirium is defined as an acute confusional state with altered levels of attention and consciousness. It presents for a short period of time with a transient and fluctuating evolution, with long-term outcomes of cognitive dysfunction. It has been observed mostly in extreme age groups and has been associated with factors that increase the risk of occurrence.

Objective: To identify any factors associated with the development of postoperative delirium in the elderly following anesthesia.

Materials and methods: An analytical cross-section study was conducted in elderly patients receiving anesthesia at a second-level hospital, from November 2016 to November 2017. The confusion assessment method was used based on 4 items for making the diagnosis of delirium. The data obtained were statistically analyzed with measures of central tendency, and the risk probability was estimated.

Results: A total of 100 patients aged between 60 and 93 years old were studied, with postoperative delirium present in 18% of the sample. There was a statistically significant association among patients with severe pain, those with a low level of education, and those who did not have a stable partner.

Conclusion: It is important to study the postoperative delirium factors to be able to identify the population at higher risk of experiencing postoperative delirium, with a view to reducing the number of long-term complications.

Keywords: Delirium, Health of the Elderly, Anesthesia, Postoperative Period, Cross-Sectional Studies

Palabras clave: Delirio, Salud del anciano, Anestesia, Período Posoperatorio, Estudios transversales

Resumen

Introducción: El delirio en el postoperatorio se define como un estado confusional agudo con alteraciones en la atención y conciencia. Este se presenta en un período corto de tiempo y presenta una evolución transitoria y fluctuante, con un desenlace a largo plazo en disfunción cognitiva. Se ha observado una mayor presentación en los extremos de la vida y su asociación con factores que aumentan el riesgo de presentación.


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**Objective:** Identify the factors associated with the presentation of postoperative delirium in elderly patients who underwent anesthesia.

**Material and methods:** A cross-sectional study was conducted in patients over 60 years old who underwent general or neuraxial anesthesia at a hospital in the northeast of Mexico. The study was approved by COFEPRIS under registration number 13 CI 2601-175 in November 2016, for Research and Health Research Ethics.

**Results:** Among the 100 patients included, 18% presented with delirium postoperatively. Factors associated with delirium included age over 70, under 60 years of age, having received general anesthesia, and duration of anesthesia over 60 minutes. Cognitive impairment with cerebral hypoperfusion was observed.

**Conclusions:** Early diagnosis and timely treatment are crucial for patients receiving anesthesia.

**Introduction**

Postoperative delirium is defined as an acute confusional state with altered levels of attention and consciousness. It is observed more frequently in elderly patients, with 10% to 60% incidence among those receiving anesthesia. This pathology is of major interest in public health, as it may evolve toward dementia, increasing healthcare costs.

It is necessary to identify the factors associated with the development of postoperative delirium. Studies at the international level report an association with the anesthetic technique, type of surgery, fluid management, genetic, and postoperative factors; however, the bibliography available in our region is limited.

Therefore, the purpose of this study was to identify the pre-operative and postoperative predisposing factors to develop delirium in elderly patients receiving anesthesia, with the aim of making an early diagnosis and administering timely treatment, and making an accurate diagnosis.

**Material and methods**

After receiving authorization from the Local Committee on Research and Health Research Ethics, an analytical cross-section study was conducted in a second-level hospital in the northeast of Mexico.

A non-probabilistic sampling in elderly adults receiving anesthesia between November 2016 and November 2017 was conducted. The size of the sample was estimated for proportions with a 95% confidence interval and a calculated probability of risk.

**Results:** Among the 100 patients included, 18% presented with delirium postoperatively. Factors associated with delirium included age over 70, under 60 years of age, having received general anesthesia, and duration of anesthesia over 60 minutes. Cognitive impairment with cerebral hypoperfusion was observed.

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The results obtained were uploaded to the Excel sheet and a database was subsequently developed, using the SPSS version 23.0 statistical software package to process the information.

The frequency of occurrence of delirium in the sample and its association with sex, age above 70 years, level of education, marital status, anesthetic technique, and severe postoperative pain was established using Pearson’s Chi-square test, considering statistical significance at a P value ≤0.05. The odds ratio (OR) was calculated with a 95% confidence interval (CI).

Results

A total of 100 patients with a minimum age of 60 years and maximum 93 years were included. The mean was 69.45 years (standard deviation = 7.95). There was a prevalence of females with 61%. 19% of the patients had no education and most (67%) had a stable partner.

With regard to the anesthetic technique used, 57% received neuraxial anesthesia and the rest received general anesthesia.

Severe postoperative pain was identified in 15% of all patients in the sample (Table 1).

A diagnosis of delirium was made in 18% of the patients; 61% of them received general anesthesia (P = 0.087), and 61% were females (P = 0.91).

60% of the patients that experienced severe pain during the postoperative period experienced delirium (P = 0.000) and the OR was estimated at 12.66, with a 95% CI (3.6–43.8).

Delirium was identified in 44% of the patients with no education (P = 0.002), with an OR of 2.45, and a 95% CI (1.6–15.9). In terms of marital status, 66% of the patients with no stable partner experienced delirium, with an OR of 5.6, 95% CI (1.9–17.4) (Table 2).

In accordance with the age of the patients, delirium was identified in 72% (P = 0.001) of all patients over 70 years of age, with an OR of 5.6, and a 95% CI of 1.8 to 17.3 (Table 2).

Discussion

Proper management of the elderly patient contributes to reduce the number of complications that finally contribute to increase the cost of healthcare and the cost to society. Hence, this age group has increasingly been the focus of attention during the past few years.12

Benavides concluded in his study that elderly patients require a different approach, to understand the physiological, anatomical, social, and life differences that develop with age, with a view to providing optimal treatment of their pathologies.12

Table 1. Overall description of the study population.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency n = 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>61 (61%)</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
</tr>
<tr>
<td>≥70 years</td>
<td>39 (39%)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>No stable partner</td>
<td>33 (33%)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>19 (19%)</td>
</tr>
<tr>
<td>Pain</td>
<td></td>
</tr>
<tr>
<td>Mild VAS</td>
<td>72 (72%)</td>
</tr>
<tr>
<td>Moderate VAS</td>
<td>13 (13%)</td>
</tr>
<tr>
<td>Severe VAS</td>
<td>15 (15%)</td>
</tr>
<tr>
<td>Type of anesthesia</td>
<td></td>
</tr>
<tr>
<td>General anesthesia</td>
<td>43 (43%)</td>
</tr>
<tr>
<td>Delirium</td>
<td>18 (18%)</td>
</tr>
</tbody>
</table>

VAS = visual analog scale.
Source: Authors.

Table 2. Probability of risk of developing delirium.

<table>
<thead>
<tr>
<th></th>
<th>With delirium n = 100</th>
<th>P</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>General anesthesia</td>
<td>11/43 (26%)</td>
<td>0.087</td>
<td>2.45</td>
<td>(0.8–6.9)</td>
</tr>
<tr>
<td>Age &gt;70 years</td>
<td>13/39 (33%)</td>
<td>0.001</td>
<td>5.6</td>
<td>(1.8–17.3)</td>
</tr>
<tr>
<td>No education</td>
<td>8/19 (42%)</td>
<td>0.002</td>
<td>5.1</td>
<td>(1.6–15.9)</td>
</tr>
<tr>
<td>No stable partner</td>
<td>12/33 (36%)</td>
<td>0.001</td>
<td>5.8</td>
<td>(1.9–17.4)</td>
</tr>
<tr>
<td>Severe VAS (&gt;7)</td>
<td>9/15 (60%)</td>
<td>0.000</td>
<td>12.6</td>
<td>(3.6–43.8)</td>
</tr>
</tbody>
</table>

CI = confidence interval, OR = odds ratio, P = Chi square, VAS = visual analog scale.
Source: Authors.
The results obtained show that a number of factors may be valuable to identify the populations at risk of developing postoperative delirium. Old age, not having a stable partner, and lack of formal education, are all sociodemographic factors that were associated with the occurrence of such condition. Similarly, experiencing severe postoperative pain is another associated factor.

According to the findings, the diagnosis of delirium increased among the older population. This is consistent with Carrillo, who advocates that the older the patient, particularly patients over 80 years old, the higher occurrence of delirium because of the vulnerability resulting from decreased brain plasticity and density. Monk further states that anesthesia plays a key role in the deleterious mechanism affecting these patients which induces neuroapoptosis, which is accentuated among this age group. Vaurio et al concluded that the presence and proper management of pain are important factors for the development of delirium.

Another sociodemographic variable considered in our study was the absence of a stable partner, which was associated with a 6-fold increased risk of experiencing postoperative delirium. Bekker refers to the involvement of the emotional status with the cognitive decline of patients; however, this variable was not identified as an associated or predisposing factor in previous studies.

Thus, in accordance with our results, we report that there are sociodemographic factors identifiable in the patient’s postoperative period that may be used as predictors of the risk to experience delirium, although these factors are not reported in the literature.

Of the few models available to predict the development of delirium in the elderly, E-PRE-DELIRIC is one of the small number of validated models that establishes the risk factors identified in postsurgical elderly patients to be admitted to an intensive care unit. The risk factors listed in this model are: age, a history of cognitive impairment, alcohol abuse, elevated blood urea nitrogen, admission category (surgery, trauma, internal medicine, inter alia), emergency admission, mean blood pressure, use of steroids, and respiratory failure. It is therefore necessary

### Table 3. Multivariate analysis of variables associated with the occurrence of delirium (n = 100).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Significance</th>
<th>B Exp</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>General anesthesia</td>
<td>0.180</td>
<td>2.40</td>
<td>(0.67–8.64)</td>
</tr>
<tr>
<td>Age &gt;70 years</td>
<td>0.148</td>
<td>2.86</td>
<td>(0–68–11.90)</td>
</tr>
<tr>
<td>No education</td>
<td>0.237</td>
<td>2.37</td>
<td>(0.56–9.92)</td>
</tr>
<tr>
<td>No stable partner</td>
<td>0.462</td>
<td>1.72</td>
<td>(0.40–7.39)</td>
</tr>
<tr>
<td>Sever VAS (&gt;7)</td>
<td>0.022</td>
<td>5.49</td>
<td>(1.27–23.64)</td>
</tr>
</tbody>
</table>

B Exp = B exponent, CI = confidence interval, n = sample size, VAS = visual analog scale.

*Statistical significance.

Source: Authors.
to conduct additional studies of the patient’s pre-operative conditions, to be able to identify the population at risk and improve the detection of cases. The variables used in our study (severe pain, no schooling, general anesthesia, male gender, and unstable partner) may represent a valuable model to predict delirium in 88% of the cases. We agree with Drews et al that highlight the importance of using a validated instrument for the detection of delirium signs and associated factors, such as those herein identified. Their study analyzed a sample of 1707 patients in the same age group as ours, with a 3-month follow-up after surgery. Their results indicated that 12% of the patients who experienced postoperative delirium developed posttraumatic stress disorder, leading to increased morbidity and mortality. However, other series differ and challenge the association between anesthesia and long-term neurocognitive impairment in healthy elderly patients.

In a meta-analysis of 17 trials in postsurgical knee patients, Scott argues that in addition to not presenting any cognitive decline, the patients showed improved information processing speeds. So Bekker suggests that only individuals at high risk of delirium because of their history would be affected following surgery under anesthesia, presenting cognitive decline or signs of delirium. Consequently, it is imperative to continue with this line of research in the population identified as vulnerable, and to follow-up the results to assess the long-term impact that a high incidence of delirium actually has on the population. As suggested by Ramsay, it is not only a question of ensuring the survival of 1 individual, but ensuring his/her quality of life, particularly in terms of the patient’s cognitive function.

One weakness of our study is the potential bias resulting from using a non-probability sampling technique. However, one of the strengths is the use of a validated instrument with high sensitivity and specificity, in addition to the similarity between our results and those reported at the international level with larger sample sizes.

**Conclusion**

The frequency of occurrence of postoperative delirium in this series was 18%. Severe pain increases by 5.49 fold the risk of postoperative delirium. Modifiable and non-modifiable variables must be further studied to improve the prognosis of patients undergoing an anesthetic procedure. Finally, the recommendation is to preoperatively identify any subjects at risk of developing delirium; according to our results, these are patients with no formal education, absence of a stable partner, and older age. The intent is to provide postoperative follow-up using validated instruments for timely diagnosis and intervention.

**Ethical responsibilities**

**Protection of human and animal subjects.**

The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics commit-tee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

**Confidentiality of data.**

The authors declare that they have followed the protocols of their work center on the publication of patient data.

**Right to privacy and informed consent.**

The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

**Financing**

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**Conflicts of interest**

The authors have no conflicts of interest to disclose.

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